cOS™

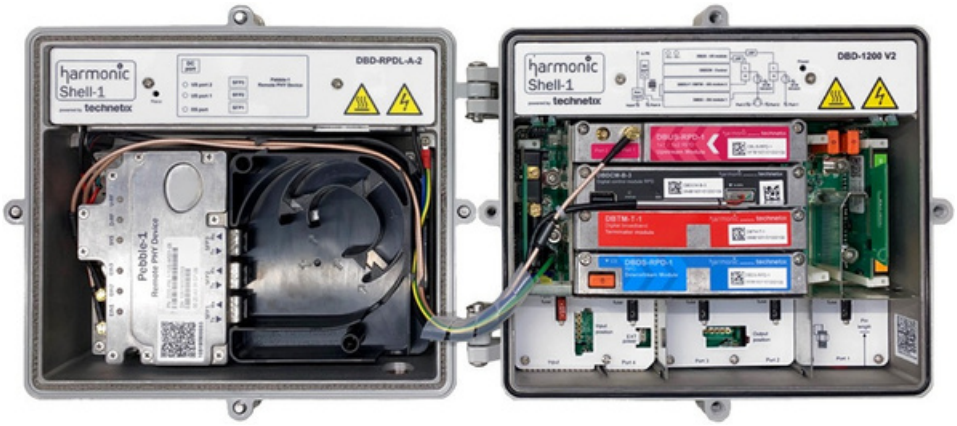
SHELL-1 REMOTE PHY NODE

The Harmonic cOS Shell-1 Remote PHY node (RPN) is a hardened outdoor enclosure for networks tasked with delivering video, data and voice services over coax.

Compact and cost-effective, the Shell-1 RPN houses the cOS Pebble-1 Remote PHY device (RPD), which supports distributed access architectures defined by CableLabs® MHAv2 specification. Shell-1 and Pebble-1 are both part of the Harmonic cOS software-based cable access solution that also includes the cOS vCMTS Core, cOS video and out-of-band engines and Wave-1 Remote PHY Shelf. Fundamentally changing the business dynamics of cable delivery, cOS introduces cable operators to unprecedented scalability, agility and cost savings. The end-to-end solution supports centralized and distributed cable access architectures that enable the fast deployment of IP-based and legacy data, video, and voice services — and sustainable capacity growth. All cOS components work together to resolve space and power constraints in the headend and hub, eliminate dependence on hardware upgrade cycles, and provide multi-dimensional scaling.

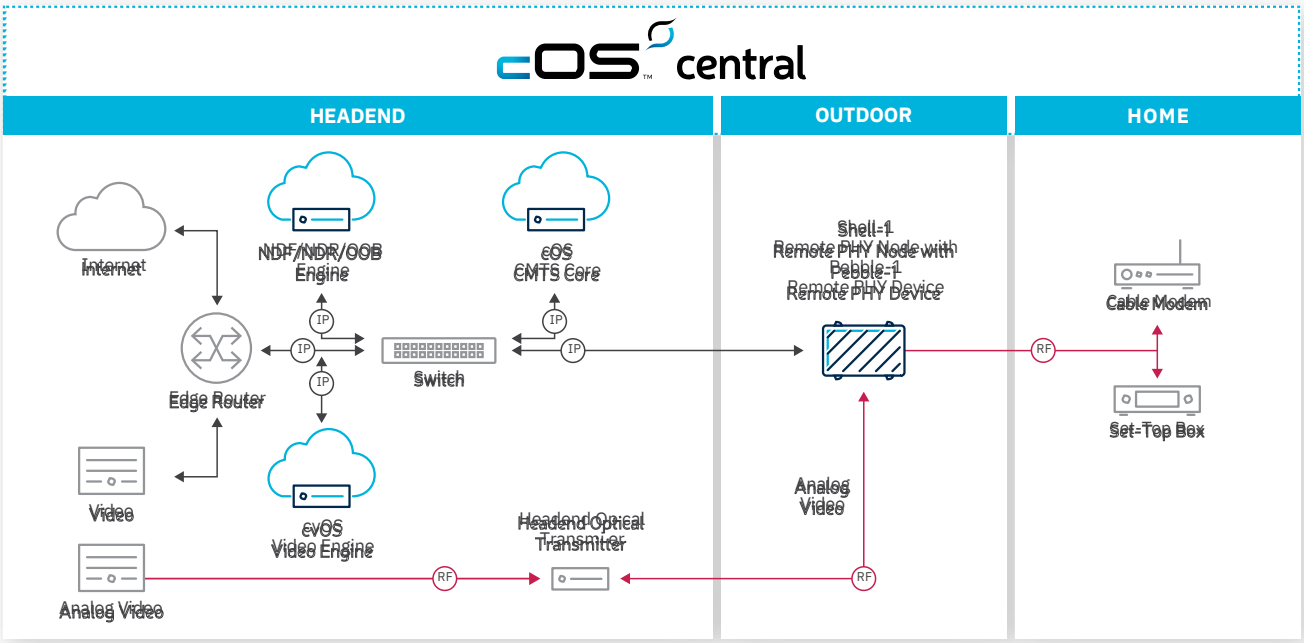
The Shell-1 RPN connects with cOS vCMTS Core to support evolving fiber deep deployments with added features, and to allow for future network growth. Multiple configurations of the RPN using Pebble-1 RPD each with one downstream and one or two upstream ports, Pebble-1 RPD with Analog Overlay and RF Channel Insertion option, RF modules of one or two downstream amplifiers are available. Segmentation options supported are 1x1, 1x2 (DSxUS) segments over 3 RF ports supported by Shell-1 RPN.

Featured in the RPN is a small size, modular architecture and an ability to replace modules in the field. Other significant characteristics are low power consumption, superior RF performance and built-in remote configuration functionality. Remote RF configuration through cOS Core software includes forward-path gain and tilt, return-path attenuation and mute switches. The Shell-1 RPN housing supports dedicated AC powering or powering over RF ports.



HIGHLIGHTS

- Small size
- Low Power Consumption
- Modular architecture
- One or two high-output RF level ports (53 dBmV(113dBuV) /channel), option to split the second port
- Supports up to 1218 MHz forward and 204 MHz return bandwidth
- Software controlled low power low RF output option
- Remotely configurable forward gain and tilt
- Remotely controlled return mute switch/attenuation for ingress control
- Automatic gain and tilt control
- Power passes through dedicated AC port or RF ports
- Easy plant upgrades with field replaceable diplex filters. Diplex filters can be swapped in the field for plant expansion



World Class Service and Support

With thousands of successful installations, Harmonic possesses unique, extensive knowledge of the cable access environment and unsurpassed expertise in managing live production networks. Harmonic technical support and field engineers possess decades of collective experience in the cable industry and have the ability to go far beyond optimal deployment strategies and troubleshooting. The Harmonic Global Service and Support organization also understands the intricacies of every ancillary system touched by the cable access network, from back-office video control planes to IP backbones to deep-fiber HFC nodes.

SPECIFICATIONS

FORWARD-PATH 1

Operational Bandwidth	54 - 1218 MHz (other: 85 - 1218 MHz, 102 – 1218 MHz, 258 - 1218 MHz)
Flatness	+/-1dB
Linear Tilt	17.0 dB over 54-1218MHz, configurable
DS RF Test Points	-20.0 +/- 1.0 dB
RF Impedance	75 Ohm
RF Return Loss	54 - 860 MHz ≥ 18 dB -1.5 dB / octave; 860 - 1200 MHz ≥ 12 dB
Output Level	@ 1218MHz 53 dBmV with forward spectrum loaded with QAM and/or OFDM channels from 258-1218MHz and 12.5 dB of tilt
Total Composite Power level, max	69dBmV (129dBuV)
RF Attenuation range	0-20dB
DS MER	47dB (typical) for TCP <69 dBmV

RETURN-PATH

Operational Bandwidth	5 - 42 MHz (other: 5 - 65 MHz, 5 - 85MHz, 5 - 204 MHz)
Flatness	+/- 0.75 dB
RF Return Loss	5 - 40 MHz ≥ 18 dB; 40 - 204 MHz ≥ 18 dB -1.5 dB / octave;
US MER	42 dB (typical)
US RF Input Power Level	0dBmV (60dBuV) - 12dBmV (72dBuV)
Ingress Switch Control	0dB, 6dB, 40dB
Attenuation Control Range	0-20dB

1 Output Level and Total Composite Power characteristics are defined for RF port 1. The RF port 2 has the same characteristics as port 1 when RF port 3 is stayed not connected. When RF signal equally split between RF port 2 and 3, Output Level and TCP characteristics for those ports will be lower than specified by 4dB)

POWER

Input Voltage	35-90 Vrms (QSW), 35-65Vrms (SineWave)
Range Power Consumption	max 52W (for single RF port configuration) max 65W (for 2 or 3 RF ports configuration)
Power feed over dedicated port	10A
Power feed over RF port	7.5A

PHYSICAL

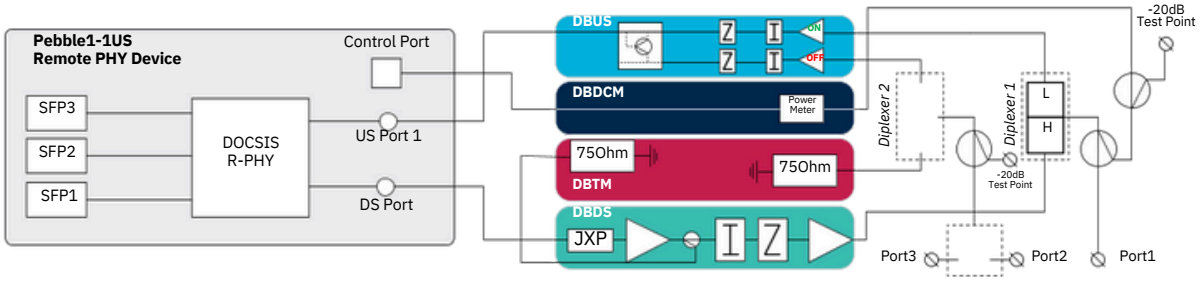
Mounting	Stand and Wall
Enclosure	IP68
Dimensions	(DxWxH) 258x220x135 mm, 10.2x8.7x 5.3 in
Weight	6 kg
External RF Ports	3
RF Test Points	2 FWD Path TPs (Internal) -20dB
Operating Temperature	-40° to 140° F / -40° to +60° C (for nodes with new lid)

ANALOG OPTICAL RECEIVER (FOR PEBBLE-1-AO)

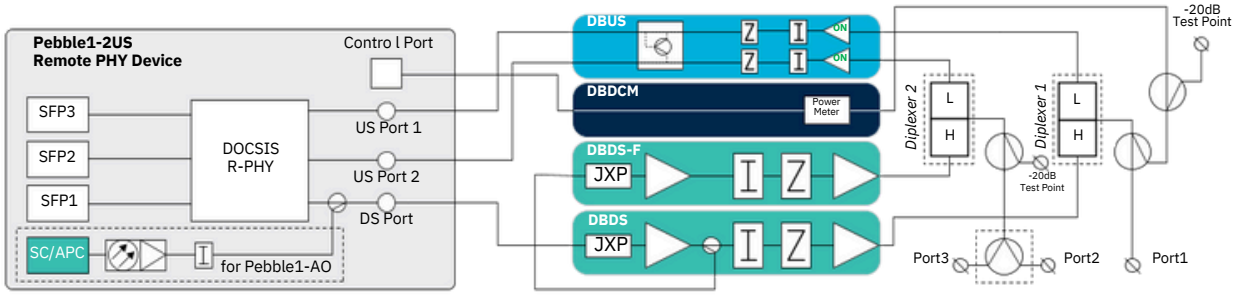
Analog Optical Input Connector	SC/APC
Optical Input Power	+2dBm ... -6dBm
Frequency Range	54MHz - 1002MHz
Wavelength Range	1260nm - 1620nm
Optical Return Loss	40dB
Maximum Number of Analog Video Channels	85
Detector Responsivity	0.85 A/W (1310) 0.95 A/W (1550)
Equivalent Input Noise	4,5 pA/ /Hz
Analog RF power level relative to digital channels	0-6dB
MER 256QAM	min 40dB for 0dBm optical input, 79 Analog channels <1km of fiber

Shell-1 R-PHY Node Configuration

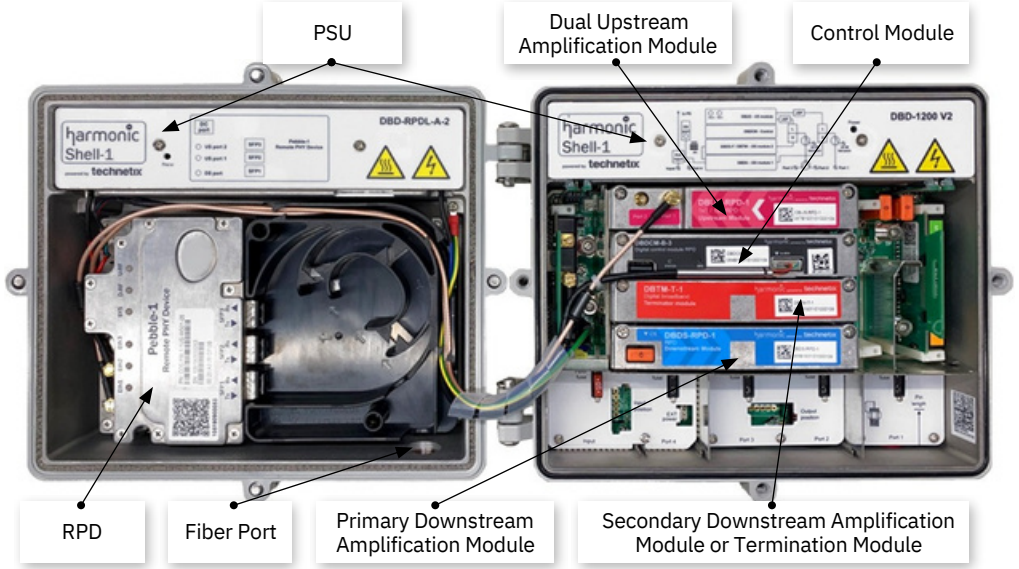
Shell-1 node, 1DSx1US, High-split, 1 RF port, Cable power (COS-SHL1-S10-H-QS-S1-N)



Shell-1 node, 1DSx2US, High-split, 2 or 3 RF ports, with or without Analog overlay, Cable power (COS-SHL1-S20-H-QS-S2-N, COS-SHL1-S21-H-QS-S2-N, COS-SHL1-S21-H-QS-S2-N, COS-SHL1-S21-H-QS-A2-N)



DBUS – upstream module / **DBDCM** – control module / **DBDS** – primary downstream amplification module / **DBDS-F** – secondary downstream amplification module / **DBTM** – termination module



ORDERING INFORMATION

Part Number	Description
COS-SHL1-S10-H-QS-S1-N	Shell-1 node, 1DSx1US, High-split, 1 RF port, Cable power
COS-SHL1-S20-H-QS-S2-N	Shell-1 node, 1DSx2US, High-split, 2 RF ports, Cable power
COS-SHL1-S21-H-QS-S2-N	Shell-1 node, 1DSx2US, High-split, 3 RF ports, Cable power
COS-SHL1-S21-H-QS-A2-N	Shell-1 node, 1DSx2US, High-split, 3 RF ports, with Analog Overlay, Cable power

Part Number	Description
COS-SHL1-DPLX-65-85	Diplexer for Shell-1, 204-258 split
COS-SHL1-DPLX-85-102	Diplexer for Shell-1, 85-102 split
COS-SHL1-DPLX-85-105	Diplexer for Shell-1, 85-105 split
COS-SHL1-DPLX-204-258	Diplexer for Shell-1, 204-258 split